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## Test 770: Case 640C (Gasoline)

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# NEBRASKA TRACTOR TEST 770 - CASE 640C GASOLINE

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean and Acting Director, Lincoln, Nebraska

## POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temp Degrees F	Barometer		
		Gal per hr	Lb per hp-hr			Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
49.72	2250	4.364	0.546	11.39	185	61	76	28.877
Standard Power Take-off Speed (540 rpm)—One Hour								
46.76	1966	3.921	0.522	11.93	186	62	77	28.893
* VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
42.92	2285	4.001	0.580	10.73	184	62	77	.....
0.00	2407	1.784	....	....	170	61	76	.....
22.11	2355	2.883	0.811	7.67	175	61	76	.....
49.68	2250	4.401	0.551	11.29	183	60	76	.....
11.19	2385	2.324	1.292	4.81	172	60	75	.....
32.58	2313	3.505	0.669	9.30	176	60	74	.....
Av 26.41	2332	3.150	0.742	8.38	177	61	75	28.913

## DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temperature Cooling medium	Degrees F Air wet bulb	Degrees F Air dry bulb	Barometer inches of mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—5th Gear											
43.25	3560	4.56	2246	4.71	4.375	0.629	9.89	180	41	43	28.908
39.79	4312	3.46	2233	5.81	4.477	0.700	8.89	180	48	54	Torq. Conv.
75% of Pull at Maximum Power—Ten Hours and Two Hours—5th Gear											
33.69	2675	4.72	2309	3.91	3.673	0.678	9.17	178	52	60	29.021
33.08	3225	3.85	2308	4.40	4.127	0.776	8.02	178	49	53	Torq. Conv.
50% of Pull at Maximum Power—Two Hours—5th Gear											
23.03	1789	4.83	2327	2.10	3.149	0.851	7.31	178	46	51	29.015
23.22	2174	4.00	2353	3.17	3.489	0.935	6.66	178	48	50	Torq. Conv.
MAXIMUM POWER WITH BALLAST											
32.67	6902	1.78	2315	14.77	1st Gear	.....	175	48	56	29.220	
42.07	5890	2.68	2247	9.74	2d Gear	.....	175	50	60	29.210	
42.44	5321	2.99	2251	8.33	3rd Gear	.....	178	48	56	29.220	
42.34	4339	3.66	2254	6.65	4th Gear	.....	180	48	56	29.220	
43.26	3571	4.54	2253	5.26	5th Gear	.....	180	48	56	29.220	
42.41	2628	6.05	2250	4.02	6th Gear	.....	180	48	56	29.220	
27.39	7090	1.45	2306	14.42	1st Gear	Torq. Conv.	180	48	55	29.260	
36.87	6384	2.17	2273	11.22	2nd Gear	Torq. Conv.	180	50	61	29.220	
37.92	6256	2.27	2244	10.84	3rd Gear	Torq. Conv.	180	48	55	29.260	
38.71	5047	2.88	2257	7.76	4th Gear	Torq. Conv.	180	48	55	29.260	
38.75	4305	3.38	2220	6.29	5th Gear	Torq. Conv.	178	49	59	29.215	
39.57	3331	4.45	2228	5.26	6th Gear	Torq. Conv.	178	48	55	29.260	
MAXIMUM POWER WITHOUT BALLAST											
32.19	2767	4.36	2297	14.64	5th Gear	.....	180	60	75	28.680	
26.11	2754	3.56	2312	14.79	5th Gear	Torq. Conv.	180	60	75	28.680	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—5th Gear											
Pounds pull	3550	3800	4000	4050	4350	4450	4300				
Horsepower	43.3	41.5	38.4	33.5	31.3	27.3	20.6				
Miles per hour	4.5	4.1	3.6	3.1	2.7	2.3	1.8				
Pounds pull (Torq Conv)	4300	4750	5250	5700	6300	6700					
Horsepower (Torq Conv)	38.8	38.0	37.8	35.0	33.6	30.4					
Miles per hour (Torq Conv)	3.4	3.0	2.7	2.3	2.0	1.7					

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-28;6;16	Two 16.9-28;6;16
Ballast	—Liquid	609 lb each	None
	—Cast iron	1846 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16;4;28	Two 7.50-16;4;28
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		14½ inches	16½ inches
Static weight	—Rear	7600 lb	2690 lb
	—Front	1840 lb	1810 lb
Total weight with operator		9615 lb	4675 lb

## Department of Agricultural Engineering

Dates of Test: October 11 to October 22, 1960

Manufacturer: J. I. CASE COMPANY, RACINE, WISCONSIN

Manufacturer's Power Rating: 52 Belt horsepower (corrected to standard conditions)

**FUEL, OIL and TIME** Fuel regular gasoline Octane No Motor 84 Research 92 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7475 Weight per gallon 6.223 lb Oil SAE 20-20W API service classification ML, MM, MS, DG To motor 1.071 gal Drained from motor 0.803 gal Transmission and final-drive lubricant SAE 90 Type multi-purpose gear lube (E.P.) Total time engine was operated 59½ hours.

**ENGINE** Make Case gasoline Type 4 cylinder vertical Serial No 322-SO-4249 Crankshaft mounted lengthwise Rated rpm 2250 Bore and stroke 3<sup>18</sup>/<sub>16</sub>" x 4½" Compression ratio 7.34 to 1 Displacement 188.4 cu in Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Oil cooler engine coolant heat exchanger for torque converter oil Fuel filter brass screen Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No 6153130 Tread width rear 48" to 76" front 52" Wheel base 79¼" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.3" Vertical distance above roadway 31" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio plus torque converter with lockout Advertised speeds mph first 1.77 second 2.60 third 2.86 fourth 3.43 fifth 4.20 sixth 5.52 seventh 8.46 eighth 13.64 reverse 2.04 and 3.40 Clutch multiple disc main hydraulic power-clutch operated by piston thru foot pedal control valve and single disc direct drive hydraulic clutch, locking turbine to engine thru hand operated control valve Brakes double disc operated by two foot pedals Steering power assisted Turning radius (on concrete surface with brake applied) right 118" left 122" (on concrete surface without brake) right 130" left 135° Turning space diameter (on concrete surface with brake applied right 248" left 256" (on concrete surface without brake) right 273" left 281" Belt pulley 1283 rpm at 2250 engine rpm diam 9¼" face 6¾" Belt speed 3105 fpm Power take-off 541 rpm at 1970 engine rpm.

**REPAIRS and ADJUSTMENTS** No repairs or adjustments.

**REMARKS** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

Only 12 gears, as selected by manufacturers representative, were used in making the maximum power runs with ballast.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 770.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT, Chairman

G. W. STEINBRUEGGE

J. J. SULEK

Board of Tractor  
Test Engineers

# EXPLANATION OF TEST REPORT

## GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

## PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

## BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  the 85% torque; maximum power;  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

## DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Power Without Ballast.** All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions; (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



Case 640C Gasoline